LIST OF CURRENT PROJECT OBJECTIVES

STATE: Missouri PROJECT NUMBER: W-13-R-41 (1987)

PROJECT CATEGORY: Research and Surveys

STUDY NO. 3: Evaluation of Management Practices and Farming Systems on Missouri Wetland Wildlife Areas

Job No. 2: Determining the nutritional value of selected moist soil seeds and wetland agricultural crops

Objectives:

1. To determine nutritive values of rowcrop and moist-soil seeds regularly consumed by waterfowl in Missouri; and determine if energy content varies with season, year, and flooding.

2. To determine metabolizable energy (M.E.) of selected rowcrops and moist-soil seeds for mallards and Canada geese.

Duration: 1986-1989

Biologist: David A. Graber

PROGRAM NARRATIVE OUTLINE PROJECT NUMBER: W-13-R-41 (1987)

STUDY NO. 3: Evaluation of Management Practices and Farming Systems on Missouri Wetland Wildlife Areas

Job No. 2:

Need:

Foods commonly produced for use by migratory birds include those from wetland agriculture and natural vegetation. Producing these foods and making them available for wild waterbirds is expensive because foods must be shallowly flooded for optimum use (Fredrickson and Taylor 1982, Fredrickson and Reid 1986). On-demand flooding requires construction of levees, as well as development of water control and water supply facilities. The initial cost of development is very expensive. For example, on the Ted Shanks Wildlife Management Area, over 3 million dollars was spent on levees and pump stations in order to achieve water control on 2650 ha. Additional monies are required annually to maintain levees, pumps, and control structures. Controlling succession of natural vegetation and planting rowcrops are other major annual management costs (Fredrickson and Taylor 1982).

Recent studies indicate that great variation occurs on the rates of degradation of seeds from rowcrops, and in the M.E. values of these seeds for waterfowl. Flooded soybeans have major losses of nutrients within 30 days, whereas flooded corn loses very little of its nutritive value over a 90-day period (Reinecke pers. comm.). These findings have important implications for determining: (1) the desirability of rowcrops for waterfowl, and (2) the impacts of the timing and duration of flooding. Some information is available on the effects of flooding on seeds from native vegetation (McGinn and Glasgow 1963). However, there is a void in our understanding of flooding effects on moist-soil seeds. M.E. values from native foods that are regularly consumed by bobwhites (Colinus virginanus) provide insights into the importance of understanding the availability of energy in foods (Robel et al. 1979). For example, although lespedeza is recommended as a management practice for bobwhite quail in Kansas, the energy values of prostrate lespedeza (Lespedeza daurica) (3.415 Kcal/g) is well below that of giant ragweed (Ambrosia trifida) (4.317 Kcal/g). Ragweed grows in abundance where soils are recently disturbed; hence, producing ragweed is not difficult and costs for production are minimal.

Habitat quality for migrant and wintering waterfowl is generally measured in terms of the area or yield of food plants produced. Such estimates provide a relative measure of the productivity of a site, but the number of waterfowl a management area can support is also a function of the quality of foods produced. Very few analyses have determined the energy content of natural foods commonly used by migrant and wintering waterfowl.

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Need (continued):

Most of the information on M.E. is from studies using domesticated galliformes, especially chicken (Fredrickson and Eggeman unpublished). Information on the M.E. of cultivated grains (barley, wheat, rye) fed to mallards suggests that these values are comparable for those from chickens fed barley and wheat (Sugen 1971). Because the values of rye fed to mallards were higher than values determined for chickens, not all results for chickens can be accurately extrapolated to waterfowl.

The most recent work with M.E. in waterfowl used mallards and pintails (Anas acuta) (Hoffman and Bookhout 1985). Feeding trials using the technique of Sibbald (1977) tested seeds from 5 species of common marsh plants (Polygonum pennsylvanicum, Leersia oryzoides, Scirpus validus, Echinochloa walteri, and Sagittaria latifolia). The results showed similar trends in energy for metabolism of pintails and mallards. Mallards metabolized the greatest amount of energy from rice cutgrass (3.00 Kcal/g dry matter) and pintails the least from softstem bulrush (0.85). Mixed diets were also tested (Hoffman and Bookhout 1985). A 50% rice cutgrass, 25% large seeded smartweed, and 25% softstem bulrush diet was metabolized better than a mixed diet of 50% large seeded smartweed, 25% rice cutgrass and 25% softstem bulrush. There is much to be learned about how different waterfowl metabolize the wide variety of agricultural and native foods that regularly appear in their diets.

Information on gross energy (G.E.) of rowcrops and some wild foods is available. G.E. values for wheat vary from a high of 4.37 Kcal/g to a low of 3.9 Kcal/g (Carpenter and Clegg 1956, Kendeigh and West 1965, Robel 1972 and Robel et al. 1979). Differences in published energy values vary because of environmental effects, genetics and fat content of seeds. Robel (1972) noted that seeds collected from the same sites among years had different G.E. values. Sunflower (Helianthus annuus) seeds from the same location had a G.E. value of 5.5 Kcal/g one year but 5.86 Kcal/g the next year. Differences in G.E. values between years are less for seeds with less than 5% fat (Robel 1972).

Because wetland habitats are in short supply and efficient management is essential, managers should consider metabolizable values when making decisions. Although production of crops that supply a mix of other nutrients, in addition to energy must not be overlooked.

The results of this study should enable managers to make better decisions concerning the nutritive value of native foods and rowcrops for wildlife. Understanding how management practices and the timing of flooding influence nutritional values should further enhance the potential for effective management of wetland habitats.

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Objectives:

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2. To determine M.E. of selected rowcrops and moist-soil seeds for mallards and Canada geese.

Expected Benefits:

Previous studies have described moist-soil management techniques and expected plant responses to varying water level manipulations (Fredrickson and Taylor 1982). Effective wetland management also requires knowledge of the role various waterfowl foods play in the seasonal nutritional needs of waterfowl. Knowledge concerning waterfowl nutrition and the seasonal quality of waterfowl foods once they are produced, will enable managers to better define wetland management objectives to meet the seasonal food needs of waterfowl. These studies will also help determine the proper role of agriculture in waterfowl management programs.

Approach:

Gross Energy of Foods

Mature seeds of selected rowcrops and moist-soil vegetation will be collected, dried and separated from chaff. Seeds will be ground in a wiley mill fine enough to pass through a 1-mm mesh screen. Samples will be subjected to proximate analyses (Agricultural Experiment Station Chemical Laboratories), amino acid assay (Station Chemical Laboratories), and G.E. determinations in the Parr adiabatic oxygen bomb calorimeter.

Feeding Trials

Canada geese and mallards will be used in feeding trials that will be conducted at the Animal Science Laboratories. Birds will be held in individual metabolism cages with trays to collect excreta. Between trials, birds will be fed a balanced maintenance diet. Twelve experimental and 3 control birds will be used in each feeding trial. Mallards will be fed 11.5 g of foodstuff and Canada geese 31 g during each trial.

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Approach (continued):

Birds will be fasted for 24 hours before each trial. Foods will be force-fed through a stainless steel tube 1.25 x 37 cm with attached funnel. Excreta will be collected after a 24-hr. period, rinsed in 500-ml plastic bottles. Samples will be oven-dried at 80°C. Dried excreta will be allowed to come to equilibrium with the atmospheric moisture, weighed, and ground in a wiley mill finely enough to pass through a 1-mm mesh screen. Samples will be oven-dried at 80°C overnight and allowed to reach equilibrium with atmospheric moisture (at least 2 hours) prior to analysis on a Parr adiabatic oxygen bomb calorimeter.

T.M.E. (Kcal/g) = GE_i - (GE_f - GE_c)/weight of food (g) where GE_i is the gross energy of the foodstuff (Kcal/g dry matter) multiplied by the weight of the food, GE_f is the energy excreted by the fed bird (Kcal/g), and GE_c is the energy excreted by the control bird (i.e., FE_m + UE_e).

Experimental design will be developed from the above approach and will be presented in a detailed project proposal to be prepared by the graduate student who will conduct the study. Frequency of sampling and total number of species analyzed will be based upon budgeted funds. Selection of seed species for objective 1 will be prioritized according to: (1) availability on the study site, (2) importance to Canada geese and mallards as judged from food habits literature and(3) whether or not nutritional values of seeds have been previously reported. Canada geese will be the priority species for objective 2.

Location:

Seeds for proximate analysis and G.E. determinations will be collected in north central Missouri; at Swan Lake NWR or Fountain Grove W.A. Feeding trials will be conducted in Columbia MO at the University of Missouri Animal Science Laboratories.

Related Federal Projects:

None

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Literature Cited:

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Evaluation of Management Practices and Farming Systems on Missouri Wetland Wildlife Areas

Schedule:

Job No. 2 will be conducted from July 1, 1986 to June 30, 1989 with the following schedule:

Activity	J	A	S	O	N	D	J	F	M	A	M	J
1986-87												
Site selection and technique assessment	x	x										
Literature review			x	x								
Detailed project proposal				x	x	x						
Seed collections							x	x	x			
Feeding trials							x	x	x			
Sample preparation and lab analyses										x	x	x
Data compilation and analyses (1987)	x	x										
Progress report (1987)			x									
1987-88												
Seed collections			x	x	x	x	x	x	x			
Feeding trials				x	x	x	x	x	x			
Sample and lab analyses										x	x	x
Data compilation and analyses (1988)	x	x	x									
Progress report (1988)			x									
1988-89												
Thesis writing				x	x	x						
Manuscript preparation							x	x	x	x		
Final report (1989)											x	x

PROJECT LEADERS:

David A. Graber, Wildlife Research Biologist, Missouri Department of Conservation, 1110 College Avenue, Columbia, MO 65201. Leigh H. Fredrickson, Professor, Gaylord Laboratory, University of Missouri-Columbia, Puxico, MO.

Cooperators

Dr. Jim E. Savage, Animal Science Research Center, University of Missouri, Columbia, MO.